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# CLAMPLESS HOSE RETAINER MECHANISM

[1] This application claims priority from provisional application serial number 60/205,748 filed May 19, 2000.

## BACKGROUND OF THE INVENTION

[2] The present invention relates generally to a clampless hose retainer mechanism for use with an air supply assembly.

[3] An air cleaner purifies and directs air into an inlet manifold and an internal combustion engine. As the air travels through the air cleaner assembly, noise is produced. A resonator is commonly employed in the air cleaner assembly to reduce the amount of noise produced. The resonator is commonly integrated into or attached proximate to the air cleaner.

[4] As air passes through a tube positioned in the resonator, the air flows and passes through a plurality of tuning holes and slots, reducing the noise generated. After passing through the resonator and the tube, the air enters a rubber hose which connects to the inlet manifold. In the prior art, the rubber hose is attached to the resonator by an external metal clamp.

[5] There are several drawbacks to utilizing an external metal clamp to connect the rubber hose to the air cleaner. For one, the external metal clamp is expensive. Additionally, as the metal clamp is external, it can be easily crushed, increasing the need for replacement. Finally, the metal clamp can corrode due to the underhood environment.

[6] Hence, there is a need in the art for a clampless hose retainer mechanism for use with an air supply assembly.

## SUMMARY OF THE INVENTION

[7] The present invention relates generally to a clampless hose retainer mechanism for use with an air supply assembly.

[8] A rubber hose of an air cleaner assembly is secured to a resonator by an internal tube inserted in the hose. In the preferred embodiment, the internal tube provides a tuning tube, as explained below. A first end of the rubber hose including an interior angled surface is inserted into a hose opening in a hose neck of a resonator. A tapered insertion end of the internal tube is inserted into the first end of the rubber hose. Since the first end of the rubber hose includes an angled surface, the tapered insertion end slides into the interior of the rubber hose. If necessary, a lubricant can be utilized. The tapered insertion end presses the rubber hose against the hose neck of the resonator, retaining and sealing the rubber hose.

[9] The internal tube further includes a retention end. In the preferred embodiment, the retention end includes a recessed portion positioned between a pair of flanges. When the internal tube is positioned into a tube opening in the resonator, a tube neck substantially engages the recessed portion, the flanges securing the internal tube in place.

[10] In another embodiment of the present invention, the rubber tube includes a plurality of seal beads positioned on the exterior surface of the rubber hose to assist in sealing.

[11] Accordingly, the present invention provides a clampless hose retainer mechanism for use with an air supply assembly.

[12] These and other features of the present invention will be best understood from the following specification and drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

[13] The various features and advantages of the invention will become apparent to those skilled in the art from the following detailed description of the currently preferred embodiment. The drawings that accompany the detailed description can be briefly described as follows:

[14] Figure 1 illustrates an air supply assembly;

[15] Figure 2 illustrates the clampless hose retainer mechanism of the present invention; and

[16] Figure 3 illustrates an alternative embodiment of the rubber hose of the clampless hose retainer mechanism of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[17] Figure 1 illustrates an air supply assembly 10. The air supply assembly 10 includes an air cleaner 12, a resonator 14 and an inlet manifold 16. Noise is produced from the inlet manifold 16 and travels through the air cleaner assembly 10. A resonator 14, such as a Helmholtz resonator, is commonly employed to reduce the amount of noise passing out of the air supply assembly 10.

[18] A rubber hose 20 connects the resonator 14 to the inlet manifold 16. An internal tube 18 positioned within the resonator 14 connects the air flow from the air cleaner 12, through the resonator 14, and into the rubber hose 20. In the preferred embodiment, the internal tube 18 is a tuning tube and includes a plurality of tuning holes or slots 22 (illustrated in Figure 2). The tuning holes/slots 22 and chamber 23 providing the resonator function. Thus, the noise is reduced. The positioning and the number of tuning holes and slots 22 in the internal tube 18 together with the required chamber 23 allow for the desired tuning of the resonator 14. Alternatively, the internal tube 18 is not a part of the resonator 14 and is part of the air cleaner 12

[19] Figure 2 illustrates the outer shell 24 of the resonator 14 which includes a tube opening 26 formed by a slightly extended tube neck 28 and a substantially aligned hose opening 30 formed by a slightly extended hose neck 32. The openings 26, 30 are each sized to substantially receive the internal tube 18 and the rubber hose 20, respectively.

[20] When assembled, a first end 34 of the rubber hose 20 is inserted into the hose opening 30. The first end 34 of the rubber hose 20 includes a slightly tapered or angled face 36 and an annular projection 38 extending from the angled face 36. When the first end 34 of the rubber hose 20 is inserted into the hose opening 30, the projection 38 substantially engages an inner wall 40 of the outer shell 24 of the resonator 14.

[21] The rubber hose 20 is sealed and retained in the resonator 14 by the internal tube 18 which passes through the resonator 14. A retention end 42 secures the internal tube 18 to the resonator 14, and a tapered insertion end 44 substantially engages the rubber hose 20 to retain the hose 20 in place. The tapered insertion end 44 includes a sloped surface

46. When the tapered end 44 is inserted into an interior surface 48 of the rubber hose 20, the sloped surface 46 assists with the insertion of the internal tube 18 within the rubber hose 20. Also, the hose is squeezed between the tube 18 and opening 30 to provide a seal.

[22] The retention end 42 includes a recessed portion 50 positioned between a radially inwardly extending flange 54 and a radially outwardly extending flange 52. When assembled, the slightly extended tube neck 28 of the outer shell 24 is positioned in the recessed portion 50, the pair of flanges 52, 54 retaining the tube neck 28 in the recessed portion 50 and the internal tube 18 in place. Rather than a radially outwardly extending flange 52, the outer end could flare outwardly.

[23] The rubber hose 20 is secured to the resonator 14 by the internal tube 18. When the air cleaner assembly 10 is being assembled, the first end 34 of the rubber hose 20 is inserted into the hose opening 30 of the resonator 14 such that the neck 56 of the rubber hose 20 substantially contacts the hose neck 32 of the resonator 14. The internal tube 18 is next inserted into the tube opening 26 of the resonator 14. As the tapered insertion end 44 is inserted within the interior surface 48 of the rubber hose 20, the sloped surface 46 slides along the angled face 36 of the rubber hose 20. If necessary, a lubricant can be added to interior surface 48 of the rubber hose 20. The internal tube 18 expands the rubber hose 20 to form a tight fit and seal with the hose neck 32 of the resonator 14.

[24] When removal of the rubber hose 20 is desired, the internal tube 18 is first released and extracted through the tube opening 26. The rubber hose 20 can then be removed through the hose opening 30.

[25] In another embodiment of the present invention, the rubber tube 120, as illustrated in Figure 3, includes a plurality of seal beads 158 positioned on the exterior surface 160 of the neck 156 of the rubber hose 120. The seal beads 158 assist in the sealing of the rubber hose 160 to the hose neck 32 of the resonator 14. Additionally, the rubber hose 120 includes a substantially arrow shaped first end 134 including an angled face 136 which assists with the insertion of the tube 18. An annual retention projection 162 is spaced from the first end 134 at a distance substantially equal to the length of the hose neck 32. Once the rubber hose 120 is positioned within the resonator 14, the retention projection 162 substantially contacts an exterior surface 58 (illustrated in Figure 2) of the resonator 14, retaining the rubber hose 120 within the resonator 14. Additionally, internal beads 137 can be utilized in the rubber hose 120 to aid in sealing or to provide insertion forces on the tapered insertion end 44.

[26] There are several advantages to utilizing the hose retainer mechanism of the present invention. For one, the hose can be installed without the use of an external metal clamp. Additionally, this assembly facilitates the installation and removal of the hose to the outer shell of the resonator. Finally, this assembly allows for a low number of re-sealings if required and allows for tampered proof sealing.

[27] The foregoing description is only exemplary of the principles of the invention. Many modifications and variations of the present invention are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed, however, so that one of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. It is, therefore, to be

understood that within the scope of the appended claims, the invention may be practiced otherwise than as specially described. For that reason the following claims should be studied to determine the true scope and content of this invention.